Fish Taxonomy for the Sacramento-San Joaquin River Delta and Surrounding Watershed

Investigator

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Summary

The Central Valley Project's Tracy Fish Collection Facility (TFCF), located upstream of the Jones Pumping Plant (JPP) in the southern portion of the Sacramento-San Joaquin Delta (Delta), is responsible for identifying, collecting, and transporting fish ≥ 20 mm fork length away from the influence of the JPP. Many fish <20 mm are collected at the facility, but quantifying the number caught is difficult to do as they are not easily identifiable to species. One of the major problems with identifying the smaller sizes of fish is that few species have easy to use, or updated taxonomic keys for making identifications. This can be problematic for managing threatened and endangered species in the Delta. For this reason, our group has created and published reports on how to identify fish at the early life stages. These reports show how to make a positive identification between wakasagi, delta smelt and longfin smelt (Wang *et al.* 2005), green and white sturgeon (Wang 2006), the eleven species of cyprinids (Wang and Reyes 2007), and the eleven species of centrarchids (Wang and Reyes 2008). Creating updated taxonomic keys with colored photographs and line drawings not only helps the Bureau with managing their facilities, but helps all agencies improve their ability to correctly identify fish.

With the continuation of this study in 2010, we hope to collect samples for completing our reference collection to aid in training the TFCF staff, expanding our image database on the web for people to download, and analyzing larval morphology and morphometrics for developing more taxonomic and dichotomous keys. The early life stages of 40 species of fishes have successfully been collected and described since 2002. Twenty-four species are yet to be undertaken or have incomplete information. The species that we will focus our efforts for 2010 include wakasagi (*Hypomesus nipponensis*), hardhead (*Mylopharodon conocephalus*), hitch (*Lavinia exilicauda*), black crappie (*Pomoxis nigromaculatus*), and spotted bass (*Micropterus punctulatus*). Once the pictures and hand drawing of the majority of the species in the Delta have been developed, they will be incorporated into volume II of the Larvae of the Sacramento/San Joaquin, which was first published by Wang (1986).

Problem Statement

Larval and juvenile fish from the Delta are difficult to identify. A complete set of taxonomic keys with color photographs and clear hand drawings have not been developed

for this watershed. The objective of this study is to completely update Wang's 1986 publication of "Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: A guide to the early life histories". The keys and photographs will also enable workers at the TFCF to accurately identify small fishes and larvae.

Materials and Methods

Wild eggs will be collected using fine mesh dip nets, 200- to 300-µm plankton tow nets (on shore or on boat), and visual inspection of substrates. Larvae will be collected using acrylic light traps (design based on Kissick 1993). Since light traps can be taxonomically biased (Marchetti and Moyle 2000), attracting some species while excluding others, we will also collect larvae using fine mesh (300-µm) beach seine nets and through salvage operations at the TFCF. Beach seines will also be used to verify fish composition of the body of water being sampled. Portions of the collected samples (*i.e.*, from net collections) will be kept alive until they grow large enough to ensure positive identification of the species.

Artificial propagation through strip spawning and induced spawning through hormone administration will also be conducted to obtain life stages of species that are difficult to find in the wild (*e.g.*, Osmeridae). Artificially-spawned larvae will be used mainly to collect myomere counts and other morphometric parameters, to verify species, and to "fill in the gaps" in the developmental staging series. Laboratory and pond spawning will be used to collect eggs from fishes that readily spawn in enclosed environments (*e.g.*, Centrarchidae).

Eggs and larvae will be photographed using a digital camera (Leica model DFC420, Leica Microsystems) attached to a stereomicroscope (Leica model MZ8). Digital images will be analyzed (measured) using Image Pro© image analysis software, referenced, and archived.

No statistical data will be analyzed or interpreted; however, early life stage data (*e.g.*, days to hatching, length at hatching, size of yolk sac, etc.) and environmental parameters will be collected and summarized.

Coordination and Collaboration

This study is a continuation of past efforts of collecting information on the early life history and life stages of every fish species found in the Delta and surrounding watershed. Specimen collections and laboratory propagation will be coordinated with the TFCF biology staff, TFCF Fish Diversion Crew (Joel Imai), TFCF management (Ron Silva), and the permitting agencies (CDFG, NMFS). René Reyes will be in charge of the biological field sampling program and the overall study coordination. The TFCF biologists and TFCF Fish Diversion Crew will aid in specimen collection. Local resources (*e.g.*, USFWS, CDFG, UC Davis, private and public hatcheries, etc.) will be fully utilized for live/preserved specimens thereby saving labor, money, and collection days. In addition, our staff and facilities are available for use/training by outside agencies upon request.

Endangered Species Concerns

No ESA listed species will be targeted during sampling; however, it is possible that both Chinook salmon and delta smelt will be encountered during sampling. Any ESA listed species sampled will be measured, counted and returned back to normal salvage operations. All fish collected for this project will be reported as take as specified on the California Department of Fish and Game permit.

Dissemination of Results (Deliverables and Outcomes)

Results collected by the program in the last several years are in different stages of publication. Recent publications include the early life stages of Cyprinidae and Centrarchidae, both published as a Tracy Series Report Volumes 32 and 42, respectively. The early life stages of the Pacific lamprey were published as a technical report in 2008 (Technical Bulletin 2008-3). A draft for the early life stages of ictalurids in the Delta is being developed. Results will also be available for poster presentations during conferences and seminars.

Literature Cited

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